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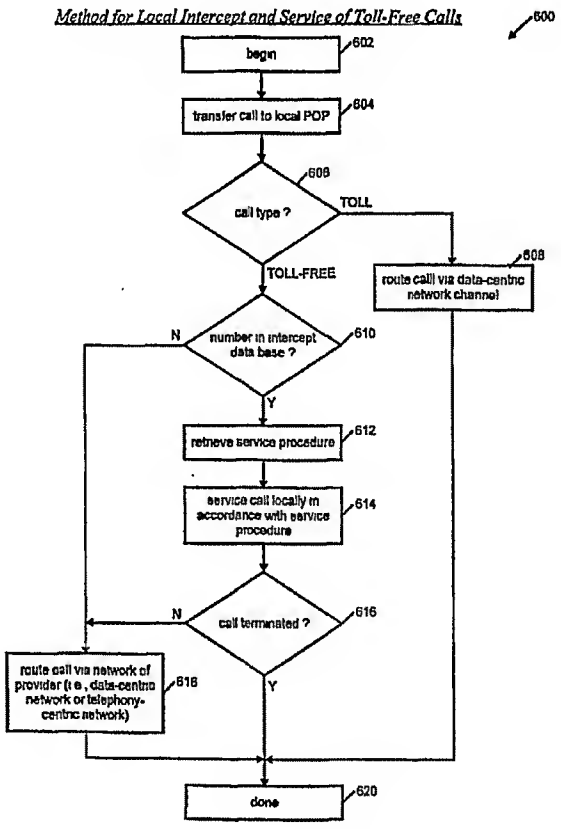
(54) Title: APPARATUS AND METHOD FOR LOCAL INTERCEPT OF TOLL–FREE CALLS

(57) Abstract

An apparatus and method are provided for locally intercepting and servicing a toll–free call, prior to incurring charges associated with routing of the toll–free call over a corresponding long–distance carrier channel. The apparatus includes a telephony–centric network server (408) and a central call management server (402). The telephony–centric network server (408) detects initiation of the toll–free call (602–606), it intercepts the toll–free call (610), and it services the toll–free call prior to accessing the corresponding toll–free carrier channel (612–616). The toll–free call is serviced according to a corresponding service procedure (404) stored within the telephony–centric network server (408). The central call management server (402) is coupled to the telephony–centric network server (408) over a data–centric network (406). The central call management server (402) maintains service procedures (404) and provides the corresponding service procedure to the telephony–centric network server (408) over the data–centric network (406).



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APPARATUS AND METHOD FOR LOCAL INTERCEPT OF TOLL-FREE CALLS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is related to the following co-pending u.s. patent applications which are hereby incorporated by reference:

APPLICATION NO.	FILING DATE	TITLE
09/239,560	1/29/99	INTEGRATED MESSAGE STORAGE AND RETRIEVAL SYSTEM DISTRIBUTED OVER A LARGE GEOGRAPHICAL AREA
09/240,367	1/29/99	A SYSTEM AND METHOD FOR PROVIDING UNIFIED MESSAGING TO A USER WITH A THIN WEB BROWSER
09/239,585	1/29/99	CENTRALIZED COMMUNICATION CONTROL CENTER AND METHODS THEREFOR
09/239,584	1/29/99	COMPUTER-IMPLEMENTED CALL FORWARDING OPTIONS AND METHODS THEREFOR IN A UNIFIED MESSAGING SYSTEM
09/240,893	1/29/99	INTERACTIVE BILLING SYSTEM UTILIZING A THIN WEB CLIENT INTERFACE
09/240,368	1/29/99	A SYSTEM AND METHOD TO MANAGE PHONE SOURCED MESSAGES
09/240,434	1/29/99	METHOD AND APPARATUS FOR NETWORK INDEPENDENT INITIATION OF TELEPHONY
09/240,435	1/29/99	APPARATUS AND METHOD FOR DEVICE INDEPENDENT MESSAGING NOTIFICATION
09/240,436	1/29/99	APPARATUS AND METHOD FOR CHANNEL-TRANSPARENT MULTIMEDIA BROADCAST MESSAGING
09/239,589	1/29/99	VOICE ACCESS THROUGH A DATA-CENTRIC NETWORK TO AN INTEGRATED MESSAGE STORAGE AND RETRIEVAL SYSTEM

DEFINITION OF TERMS

Data-centric network: a network that carries digital data, primarily to facilitate information exchange among computers and computer peripherals. Examples include distributed computer networks such as the Internet.

Telephony-centric network: a network that carries telephony information such as voice, fax, page messages, and the like, primarily to facilitate information exchange among telephony devices.

Message: a communication which may be transmitted via either the data-centric network or the telephony-centric network. Examples include voicemail, electronic mail (email), facsimile (fax), page, and the like.

Telecommunication device: POTS telephone, cellular telephone, satellite telephone, web telephone, PC (desktop and laptop), web surfer, personal digital assistant (PDAs), facsimile machine, teletype, modem, video telephone, set top telephone.

Web telephone: a telephone implemented via a computer that is coupled to the data-centric network. An example is a PC with microphone, speaker and internet connection.

Set top telephone: a telephone set coupled to a cable-based set top box, bypassing the local telco provider. The cable-based system may be provided by, for example, WebTV, TCI cablevision.

Web surfer: an Internet-ready PC with a network connection and pre-installed web browser.

PDA: personal digital assistant, e.g., Palm Pilot available from 3COM.

Thin Web Client: A commonly employed web browser such as Internet Explorer or Netscape Navigator – JAVA enabled.

PSTN: Public Service Telephony-centric network, e.g., AT&T, MCI, Sprint-owned telco.

GUI: graphic user interface

POTS: plain old telephone service

NOC: Network Operations Center

POP: point of presence, e.g., co-location at a local telco switch or at a company controlled area with T1 connections to a local switch.

WPOP: Web POP

VPOP: Voice POP

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates in general to the field of telephony, and more particularly to an apparatus and method for locally intercepting and servicing a toll-free call.

2. Description of the Related Art

The invention of the telephone at the turn of the century presented a new form of communication to the population at large. Whereas prior messages were delivered directly to a message recipient either by mail, telegraph, or personal courier, telephones introduced a new option for delivering a message. More urgent matters were treated immediately with a telephone call while less important matters were relegated to the mail.

Technological advances in the field of telephony have only served to intensify the sense of immediacy that so profoundly dictates the business models in use today. The provision of affordable long-distance services in particular has resulted in the creation of entire departments within certain businesses consisting exclusively of customer service representatives whose sole responsibility is to answer incoming calls provide fast-turn product support, account management, and answers to frequently asked questions (FAQs). Whereas businesses in former times were afforded the luxury of time in dealing with customers' issues, businesses during the age of inexpensive long-distance were forced to adjust their practices to comply with their customers' desire for more immediate response to their concerns.

Deregulation within the communications industry has contributed extensively to the affordability of telecommunications services. In most parts of the United States today, a consumer is allowed to choose from hundreds of long-distance carriers for routing of his/her to its intended destination. It is common practice today for a consumer to specify a particular long-distance carrier who will by default be used to route the consumer's long-distance calls. This specification is known as direct provisioning. But a caller can also override direct provisioning to select another long-distance carrier to route a specific call or group of calls.

Routing logic within a particular local switch distributes calls to specified carrier equipment based upon direct provisioning or overriding commands provided by a caller.

But perhaps the most notable change in the way that businesses service their long-distance customers has come about as a consequence of the proliferation toll-free calling. In order to provide more competitive levels of customer service in the marketplace, many businesses have chosen to bear the long-distance charges associated with incoming calls. Consequently, callers to a particular company's toll-free, or 800, number no longer incur a charge for the call. Instead, the particular company itself incurs the cost of the call. Today, consumers insist upon toll-free service as an essential feature of a company's business practice.

In spite of the name, toll-free service is not toll-free. It is simply a reversing of charges for a long-distance call. Hence, when a caller places a call to a toll-free subscriber, routing logic within a local telephone switch sends the call to its destination over the particular carrier's channel who issued the corresponding toll-free number. As a result, the particular carrier notes the duration of the call and charges the subscriber for the cost of the call rather than the caller.

In recent times, consumers have become so fastidiousness about the time required to obtain toll-free customer service that today it is viewed as unacceptable to be met with a busy signal when placing a toll-free call. What most customers desire is to call a toll-free number and to have the call immediately picked up by a company's customer service representative. And while this is the expectation, it is not common practice, primarily because to provide such a level of service a business would have to maintain enough incoming telephone lines and associated human attendants to address peak traffic times of the day. Maintenance of telephone equipment and attendants is a significant business expense for any company. Accordingly, what most businesses do is provide a limited number of attendants and incoming toll-free lines—enough to deal with average incoming traffic levels. In addition, automatic answering equipment is provided to answer incoming toll-free lines when an attendant is not available. The incoming toll-free calls are thus immediately answered and placed into a queue until an attendant becomes available.

While a caller is on hold within the queue, the automatic answering equipment may perform certain tasks to service the call such as obtaining account information from the caller, or asking the caller to select from a series of voice mail menus so that the call can be more optimally routed to a free attendant. More advanced equipment attempts to completely service

the call by providing the caller with access to prerecorded answers to frequently asked questions.

It is not uncommon today for callers to experience some number of minutes of hold time each time they call into a toll-free subscriber facility. And whether the wait is short or intolerable, the toll-free subscriber is paying for the call. In fact, it is well established that during certain portions of the workday, some large toll-free subscribers simply inform callers that no attendants are available and then they automatically hang up—to save the costs associated with placing customers on hold. Thus, the subscribers incur charges even when they are informing customers that they are not going to service their calls.

Therefore, what is needed is a method that allows a toll-free subscriber to avoid the unnecessary charges associated with placing an incoming toll-free call on hold.

In addition, what is needed is an apparatus that provides on-hold service for a toll-free call prior without incurring toll-free carrier charges while such service is being provided.

Furthermore, what is needed is a toll-free call intercept and service mechanism that captures toll-free calls at a local switch prior to placing the calls over a toll-free carrier.

SUMMARY

To address the above-detailed deficiencies, it is a feature of the present invention to provide an apparatus and method for intercepting an servicing a toll-free call, prior to incurring charges associated with placing the toll-free call through a designated toll-free carrier.

Accordingly, the present invention provides a method for intercepting and managing a toll-free call. The method includes accessing a telephony-centric network server; detecting initiation of the toll-free call; prior to transferring the toll-free call to a corresponding toll-free carrier channel, servicing the toll-free call; and if required, utilizing the corresponding toll-free carrier channel to complete the toll-free call.

An benefit of the present invention is that a toll-free subscriber does not incur carrier charges while a toll-free call is being serviced.

In another aspect, the present invention provides an apparatus for locally managing a toll-free call. The apparatus has a telephony-centric network server and a central call management server. The telephony-centric network server detects initiation of the toll-free

call, it intercepts the toll-free call, and it services the toll-free call prior to accessing a corresponding toll-free carrier channel. The toll-free call is serviced according to a corresponding service procedure stored within the telephony-centric network server. The central call management server is coupled to the telephony-centric network server. The central call management server maintains service procedures and provides the corresponding service procedure to the telephony-centric network server.

Another benefit of the present invention is that toll-free traffic bottlenecks at a subscriber facility are alleviated because more calls are serviced prior to being sent to the facility.

In a further aspect, the present invention provides a toll-free call management apparatus. The toll-free call management apparatus includes a telephony-centric network server and a central call management server. The telephony-centric network server intercepts and services a toll-free call prior to accessing a corresponding toll-free carrier channel. The telephony-centric network sever has intercept logic and a call manager. The intercept logic monitors signaling commands provided from equipment that has accessed the telephony-centric network server and detects if the signaling commands direct placement of the toll-free call. The call manager is coupled to the intercept logic and services the toll-free call according to a corresponding service procedure. The central call management server is coupled to the telephony-centric network server and provides the corresponding service procedure to the telephony-centric network server.

A further benefit of the present invention is that information obtained from servicing a toll-free call locally can be transmitted to a subscriber facility more efficiently than would be otherwise experienced through an interactive session with a caller.

In yet another aspect, the present invention provides an apparatus for locally servicing a toll-free call. The apparatus has service procedure logic, intercept logic, a call manager, and a data-centric network. The service procedure logic prescribes a number identifying the toll-free call along with a corresponding service procedure. The intercept logic is coupled to the service procedure logic. The intercept logic monitors signaling commands provided from an originating line to determine if the number has been entered and accesses the service procedure logic to retrieve the corresponding service procedure. The call manager is coupled to the intercept logic and services the toll-free call according to the corresponding service procedure. The data-centric network is coupled to the service procedure logic and provides the

corresponding service procedure to the service procedure logic from a network operations center.

Yet another benefit of the present invention is that large-volume toll-free subscribers achieve significant toll-free hold time savings during peak traffic hours.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects, features, and advantages of the present invention will become better understood with regard to the following description, and accompanying drawings where:

FIGURE 1 is a block diagram illustrating the architecture of a related art telephony-centric network.

FIGURE 2 is a block diagram illustrating how toll calls are routed via interexchange carrier channels within the related art telephony-centric network.

FIGURE 3 is a diagram illustrating how toll-free calls are distributed from a destination local switch within the related art telephony-centric network to a high-volume toll-free subscriber facility.

FIGURE 4 is a block diagram illustrating an apparatus according to the present invention for locally intercepting and servicing a toll-free call.

FIGURE 5 is a block diagram illustrating details of a local telephony-centric network server according to the present invention.

FIGURE 6 is a flow chart illustrating a method according to the present invention for locally intercepting and managing a toll-free call.

FIGURE 7 is a flow chart illustrating a service procedure according to the present invention for allowing a caller to access answers to frequently asked questions.

FIGURE 8 is a flow chart illustrating a service procedure according to the present invention for determining optimum call routing.

DETAILED DESCRIPTION

In light of the above background on toll and toll-free call handling techniques, several related art examples will now be discussed with reference to FIGURES 1 through 3. These

examples illustrate how a subscriber to toll-free number services incurs unnecessary costs each time an incoming toll-free call is put on hold. For businesses having large numbers of incoming toll-free lines, such costs represent a significant overhead expense. Following this discussion, a detailed description of the present invention will be provided with reference to FIGURES 4 through 6. The present invention provides the capability for a toll-free call to be intercepted and serviced at its local origination point, prior to incurring toll-free carrier charges.

Referring to FIGURE 1, a block diagram 100 is presented illustrating the architecture of a related art telephony-centric network. The block diagram 100 shows two local telephone network interfaces 112, one at POINT A and another at POINT B. The telephone network interface 112 is also referred to as a local switch 112. The block diagram 100 additionally depicts two telephones 102 connected to the local telephone network interfaces 112. The block diagram 100 shows three types of channels for transmitting telecommunication signals: a hardwired channel 114, a radio frequency (RF) line-of-sight (LOS) channel 118, and a satellite communications (SATCOM) channel 122.

In operation, each of the telephones 102 are provided with a telephone number, so that they may be readily accessed by the local telephone network interface 112 for call transmission and receipt. The local switch 112 is the point where local telecommunication devices 102 interface to the telephony-centric network communication channels 114, 118, 122. A transmitting local device 102 at POINT A places a call to a compatible receiving device 102 at POINT B by providing a telephone number assigned for the receiving device 102 at POINT B to the local switch 112 at POINT A. The local switch 112 at POINT A then routes the call to the local switch 112 at POINT B via the hardwired channel 114, the RF LOS channel 118, the SATCOM channel 122, or a combination thereof. The local switch 112 at POINT B provides final routing of the call to the receiving device 102. For a given call, routing logic (not shown) within the local switch 112 at POINT A determines which telephony channel 114, 118, 122 or combination of channels 114, 118, 122 to use for the transmission. This determination is based upon a number of factors to include the geographic separation of POINT A and POINT B, the availability of a channel 114, 118, 122 at the time the given message is transmitted, and any preferences that are specified by a caller. For example, a call from San Francisco to San Jose, because the two points are only a few miles apart, is most likely transmitted over the hardwired, or landline, channel 114. This channel 114 modulates electrical signals over wires or fiber-optic cables to communicate the call between San Francisco and San Jose. A second

call from San Francisco to Los Angeles, because the two points are separated by hundreds of miles, may be transmitted over the RF LOS channel 118. This channel type translates electrical signals provided by the local switch 112 in San Francisco to RF signals and transmits the second call between a number of RF LOS antennas 116 for delivery to Los Angeles. The RF signals are then translated back to electrical signals compatible with receiving devices in Los Angeles. A third call from San Francisco to Paris, because the two points are separated by thousands of miles, may be transmitted over the SATCOM channel 122. This channel translates electrical signals provided by the local switch 112 in San Francisco to RF signals and transmits the third call between a transmitting satellite antenna 120 to a satellite 124 above the Earth. The satellite 124 relays the third call to a receiving satellite antenna 120 near Paris. The RF signals are then translated back to electrical signals compatible with receiving devices in Los Angeles. One skilled in the art will appreciate that many factors influence the channel medium 114, 118, 122 chosen for transmission of a given call over the telephony-centric network and that the choice of medium 114, 118, 122 is transparent to both the call originator and the call recipient. A call between San Francisco and Paris could just as well be transmitted by landlines 114 as by a satellite 124—what the originator and recipient hear is words spoken over a telephone 102. Although FIGURE 1 depicts telephones 102 connected to the local switches 112, one skilled in the art will appreciate that various other devices may be used to place calls of differing types over the telephony-centric network. These devices include computers equipped with telecommunications apparatus, facsimile machines, cellular telephones, and the like.

Regardless of the channel 114, 118, 122 provided for transmission of a message, it is important to note that the local switch 112 is the point of interface to the telephony-centric network and that each telephone 102 connected to the network is accessed, or addressed, by a unique telephone number. To be accessed, that is, to place and receive calls, a device 102 must be connected to the telephony-centric network and must have an assigned telephone number. Use of the telephone number is the only way to address the telephone 102. Moreover, a telephone 102 connected to the telephony-centric network may not be accessed via any other network except through a corresponding local switch 112.

As is FIGURE 1 shows, there are different types of channels 114, 118, 122 for delivering telecommunications signals between local switches 112. Up through the early 1980's, all of the assets in the United States associated with the telephony-centric network were

managed by a single business entity. However, deregulation of telecommunications during the 1980's has allowed numerous service providers to compete for different aspects of the telecommunications business. For example, presently the government allows a local telephone company to exclusively provide local services within a specified geographic area, known as a local exchange. The local telephone company is also called a local exchange carrier. Typically, calls that are placed within the local exchange are serviced by the local exchange carrier and are called local calls. Calls that are placed between two local exchanges are known as interexchange calls, or long-distance calls. Long-distance, or long-haul, carriers provide for transmission of telecommunications signals between local exchanges by employing the types of channels 114, 118, 122 discussed above. Since local calls are handled by a single service provider, it has become customary for the service provider to charge a flat rate for unlimited local calls. A long-distance call, on the other hand, incurs cost based upon duration of the call, the duration typically being measured in minutes. For this reason, long-distance calls are also referred to as toll calls. FIGURE 2 more specifically describes how long-distance service providers are utilized to route toll calls.

Referring to FIGURE 2, a block diagram 200 is presented illustrating how toll calls are routed via interexchange carrier channels 216 within the related art telephony-centric network. The block diagram 200 shows two telephones 202 connected to two local switches 210, one at point A and another at point B. Each of the two local switches 210 contains routing logic 212. The two local switches 210 are connected by eight interexchange carrier channels 216, designated as CHANNEL A 216 through CHANNEL H 216. A specific carrier channel 216 may employ any or a combination of the channel media types 114, 118, 122 shown in FIGURE 1 for transmission of telecommunications signals between the two local switches 210. For the purposes of illustration, assume that each of the carrier channels 216 is provided by a different interexchange service provider. Although only eight carrier channels 216 are shown in the block diagram 200, one skilled in the art will appreciate that there are hundreds of interexchange service providers competing for business within the market. For simplicity, only eight interexchange carrier channels 216 are shown in the block diagram 200.

Operationally, when a caller from a telephone 202 or other like telephony-centric network device 202 accesses a corresponding local switch 210, routing logic 212 within the local switch 210 monitors signaling commands on a corresponding incoming line 203, or circuit. The signaling commands typically indicate a telephone number that the caller enters

from the telephone 202. If the signaling commands indicate that the caller desires to make a local call, then the local call is placed exclusively by equipment (not shown) provided by a local exchange carrier. However, if the signaling commands indicate that the caller desires to make a toll call, then the routing logic 212 must select a long-distance carrier channel 216 for transmission of the telecommunications signals from the local switch 210 at point A to the destination local switch 210 at point B.

Presently, three techniques are employed by the routing logic 212 to select, or access, long-distance transmission logic 214 for routing of an interexchange call. A first technique, direct provisioning, is the default technique used by local exchange carriers. When signaling commands indicate that the caller initially enters a "1" over the circuit, then the routing logic 212 directs the toll call to transmission logic 214 that has been previously designated (i.e., provisioned) by the caller for long-distance calls. For example, if the caller has provisioned long-distance services for his/her circuit 203 to Company A, then each time the caller dials a long-distance number using the conventional method, the toll call will be routed to Company A's transmission logic 214. The transmission logic 214, in turn, will route the toll call over Company A's carrier channel 216 to a destination switch 210. At the destination switch 210, Company A's transmission logic 214 will provide the call to destination routing logic 212. The routing logic 212 in the destination local switch will route the call to the destination telephone 202. Accordingly, the local switches 210 will route toll calls for lines 203 that have directly provisioned toll calls to Company B through Company B's equipment 214, 216. The technique operates similarly for Company C through Company H. If a particular long-distance service provider does not have a carrier channel 216 or equipment 214 connected to a given local switch 210, then that service provider generally leases another service provider's assets 214, 216 to provide toll service at the switch 210.

A second technique, access code entry, is used by a caller to override direct provisioning during a calling session. Rather than initiating a long-distance call in the conventional manner, that is, by dialing 1 plus an area code plus a local telephone number, the caller will first enter a 7-digit number to access a specific long-distance service provider's equipment 214. This 7-digit number is known as a presubscribed interexchange carrier (PIC) code. When a PIC code corresponding to a specific long-distance carrier, say Company F, is entered, then the local switch 210 will route the ensuing toll call via Company F's equipment

214, 216, overriding any previous direct provisioning decisions that the caller may have made. Each long-distance carrier has a corresponding PIC code.

A third technique that allows a caller to access a specific long-haul carrier's equipment 214, 216 to place a toll call is simply dialing a telephone number provided by the specific long haul carrier. When the caller dials the telephone number, routing logic 212 routes the connection to the specific carrier's equipment 214, 216 for placement of the toll call.

Direct provisioning, access code (PIC code) entry, and direct call entry are the three principal techniques that are used to route interexchange calls to long-distance carriers. In previous years, the direct provisioning technique prevailed in use. However, due to intense competition in more recent years for long-distance services, use of the two latter techniques by consumers has increased. In particular, callers now are using the two overriding techniques to take advantage of toll savings according to time of day. For example, a caller may use Company A's services during the morning hours, Company B's services during the afternoon hours, and Company D's services during the evening hours. In fact, large-volume consumers utilize specialized equipment (not shown) to automatically enter selected PIC codes or direct access numbers during certain times of the day. For this reason, callers in a large business may not even be aware of which long-distance carrier is being employed to place his/her call.

The provision of toll services has become so competitive that many businesses have chosen to bear the cost of long-distance services that would otherwise be charged to customers calling the businesses. This feature of long-haul telephony is known as toll-free calling, 800 calling, or free incoming call service. Toll-free calling is, however, somewhat of a misnomer because corresponding calls are not actually free of charges, the charges are simply borne by a recipient of the calls: a toll-free subscriber. The toll-free call is only free for a call originator.

Presently, there are two area codes within the United States that are used to indicate toll-free calls: 800 and 888. When a call originator dials a given toll-free number having 800 or 888 as an area code, the routing logic 212 within the local switch 210 sends the call to the long-distance service provider's equipment 214, 216 that corresponds to the given toll-free number. For example, suppose Company E has provided a subscriber with a toll-free number, say (888)222-4444, then all calls to that toll-free number are routed to the subscriber's facility over Company E's equipment 214, 216. Regardless of the long-distance service provider that an originating caller has selected (via provision, PIC code, or direct access) initially, the toll-

free call is routed by the routing logic 212 to Company E's equipment 214, 216 for completion. And the subscriber, rather than callers, bears the cost of all calls to that number.

Toll-free number use has proliferated in the marketplace to the extent that now consumers are demanding toll-free service—even from small businesses. Because of this, businesses are being forced to provide toll-free support to their customers as standard fare. In fact, not only have consumers insisted upon free telecommunications access to businesses, but they now also require immediate access, that is, they do not cooperatively tolerate busy signals or long wait times. In response, businesses are now utilizing toll-free call routing equipment on-site to automatically answer incoming toll-free lines, to attempt to mollify waiting callers, and to optimally route toll-free calls to attendants. Routing of incoming toll-free calls within a business is more specifically described with reference to FIGURE 3.

Referring to FIGURE 3, a diagram 300 is presented diagram illustrating how toll-free calls are distributed from a destination local switch 310 within a related art telephony-centric network to a high-volume toll-free subscriber facility 320. The diagram 300 shows a toll-free call 311 from an originating caller that has been placed over a toll-free carrier channel (not shown) from an originating local switch (not shown). The toll-free call 311 is routed to forward/busy logic 312 within the destination switch 310. The diagram 300 also depicts N circuits 314, or trunks 314, that connect the destination local switch 310 to a toll-free subscriber facility 320. Within the toll-free subscriber facility 320, the trunk lines 314 are connected to private branch exchange (PBX) equipment 322. PBX equipment 322 is merely telecommunications equipment used by a business to route calls to telephones 324 within a private facility 320. The PBX equipment 322, or PBX switch 322, is typically owned and operated by the business rather than a local exchange carrier.

In operation, the toll-free subscriber 320 will obtain a sufficient number of incoming toll-free lines 314 to support a prescribed number of simultaneous incoming toll-free calls 311. This prescribed number is typically specified based upon a tradeoff between the cost of providing a certain level of toll-free service balanced against some measure of customer satisfaction. For instance, as mentioned above, it is accepted in the marketplace that a consumer does not expect to receive a busy signal when dialing a toll-free number. In light of this expectation, the subscriber 320 may chose to obtain toll-free lines, to acquire toll-free routing equipment 322, and to provide telephones 324 and corresponding attendants (not shown) to insure that incoming calls are answered by an attendant within a specified number of

minutes. In other words, incoming toll-free calls are automatically answered by the PBX equipment 324, and then put on hold until an attendant is free to speak with the caller. Although the subscriber 320 obtains a single toll-free number, in practice calls 311 to this number are routed by the forward/busy logic 212 in a local switch 210 to one of the N incoming trunk lines 314. Optimally, the subscriber 320 obtains a sufficient number of incoming lines 314 so that callers to the toll-free number never receive a busy signal.

Trunk lines 314, however, are relatively inexpensive to maintain, particularly if they are sitting idle. Attendants, in contrast, are exceedingly expensive to maintain. Hence, to control cost, most toll-free subscribers 320 provide only a minimal number of attendants. Were they to provide a sufficient number of attendants, then all incoming calls would be immediately answered by an attendant. As it stands, the general case is that an incoming call is immediately answered by the PBX switch 322, and thenceforth the caller is forced to listen to prerecorded messages about how important his/her call is to the business until an attendant is available to speak with the caller.

Because attendant labor is so costly, many high-volume toll-free subscribers 320 have attempted to automate particular aspects of incoming call protocol. For example, it is not uncommon today for a caller to be prompted by special PBX equipment 322 to enter, say, an account number, prior to the call being routed to an attendant telephone 324. When the attendant telephone 324 picks up, the entered account number is presented to the attendant along with, perhaps, pertinent account information. Alternatively, the special PBX equipment 322 will prompt a caller to select options from a sequence of prerecorded voice menus in order that the call may be routed to a specific group of attendants that provide support services for, say, product XYZ. More specifically, when a caller dials the subscriber's toll-free number, the call is immediately answered by the PBX switch 322 and put on hold. During the hold time, the caller is prompted to "Press 1 if you are calling about product XYZ. Press 2 if you are calling about product ABC." And etc. The call is then routed based upon the caller's selection.

Yet another approach to handling toll-free calls involves providing automated response features. For example, some subscribers 320 provide a menu when a call is on hold to allow a customer to select from several prerecorded messages that address frequently asked questions (FAQs). Other subscribers 320 prompt a caller to enter a facsimile contact number. Following entry of the contact number, the callers are allowed to select from a FAQ menu for automated

transmission of a facsimile answer to their question. In many instances, not only do automated response features appease a waiting caller, but they also provide sufficient services to the waiting caller that he/she chooses to accept the automated response and terminate to call—prior to being connected to an attendant.

Yet, in a scenario that is only exceeded by customers receiving a busy signal when they call, some subscribers 320 have begun the practice of automatically terminating incoming calls. More specifically, during peak traffic times, the PBX switch 322 automatically answers an incoming toll-free call and announces to the caller, "All of our attendants are busy. Please call back at a later time." The call is then automatically terminated.

Why the above practice? Is it because the subscriber 320 holds that a customer would be less dissatisfied to be automatically terminated than they would to be placed on hold for, say, 30 minutes? Perhaps. But it is difficult at best to assign an immediate figure of merit to customer dissatisfaction. It is much more cost-effective in the near-term sense for the subscriber 320 to terminate the call simply to avoid paying excessive and unnecessary toll charges for the time that the customer is on hold.

Indeed, a common thread that runs through all of the above-noted toll-free call handling techniques is that every single minute that a customer is on hold, regardless of how he/she is being appeased or serviced, the subscriber 320 is incurring the expense of the call. The expenses continue to accrue is because the toll-free carrier has already routed the call through a toll-free channel and is actively providing toll-free service for the subscriber 320. It is the subscriber's choice that the call was answered and put into an automated holding queue. Thus, computation of the hold-time expense associated with a given subscriber facility 320 comes in a straightforward manner.

Suppose that sufficient equipment 314, 322, 324 is provided at the facility 320 so that each incoming line 314 experiences a 25-percent pickup delay rate, that is, each line 314, on average, is placed on hold for 25 percent of the time that the line 314 is active. Assuming that all lines 314 are always active during 10 hours of a workday, it follows that each line incurs 150 minutes of hold-time during the workday. If the subscriber pays, say, 10 cents per minute to a toll-free carrier for each incoming line 314, then the subscriber 320 incurs a $15.00 hold charge per line per day. This is a significant expense, even for a single-line subscriber. The problem is simply compounded in a high-volume facility 320. More specifically, a facility 320 with, say, 200 incoming toll-free trunks 314 would incur $3000 per day of expenses tied

directly to placing customers on hold 25 percent of the time. In light of this cost, it is certainly conceivable that many subscribers 320 would choose to start automatically terminating incoming calls when pickup delay rate at their facility 320 exceeds some prescribed threshold. Because customers today expect their calls 311 to toll-free numbers to be immediately answered, albeit by an automated system 322, the problem of hold-time expense has become a matter of great concern to many toll-free subscribers 320. One skilled in the art will appreciate that any means of reducing hold-time cost, without decreasing quality of service provided by a subscriber 320, is very desirable.

The present invention overcomes the problem of hold-time expense incurred by a subscriber 320 by providing a apparatus to intercept and service a toll-free call at the local origination level, prior to incurring charges associated with a corresponding toll-free carrier. As a result, for calls that are completely serviced at the local level, the subscriber never incurs any toll-free expense at all. For calls that are serviced and then subsequently completed over a toll-free carrier channel, the present invention provides a means to control traffic flow by reducing the number of simultaneous incoming calls at the subscriber's facility. The present invention is more specifically described with reference to FIGURES 4 through 6.

Now referring to FIGURE 4, a block diagram 400 is presented illustrating an apparatus according to the present invention for locally intercepting and servicing a toll-free call. The block diagram 400 includes a central call management server 402 located at a network operations center. The central call management server 402 includes call service procedure logic 404. The central call management server 402 is connected to a data-centric network 406. In one embodiment, the data-centric network 406 is the Internet, also known as the World Wide Web. In an alternative embodiment, the data-centric network 406 is a private packet-switched network. The block diagram 400 also includes telephony-centric network servers 408 that interface to the data-centric network 406 and that communicate with corresponding local telephone network interfaces 454, or local switches 454. The block diagram 400 also depicts N conventional long-distance carrier channels 456 connecting the two local switches 454.

In contrast to a telephony-centric network, the data-centric network 406 is a network that carries digital data, primarily to facilitate information exchange among computers and computer peripherals. Initially, data-centric networks 406 were used chiefly for non-real-time applications such as electronic file transfer. However, in more recent years, data transfer technologies have improved to the extent that data-centric networks 406 are now being used to

transfer real-time data such as audio and video. Because internet protocol (IP) is used most often to transfer data over the internet, long-distance services provided over a data network 406 are sometimes known as IP telephony services.

Operationally, telecommunication services are provided according to the present invention by collocating telephony-centric network servers 408 with corresponding local telephone network interfaces 454, very much in architecture like the long-distance carrier equipment 214 depicted in FIGURE 2. The difference between conventional carrier equipment 214, 216 and data-centric carrier equipment 408, 406 according to the present invention lies in the fact that the data-centric network 406 is used as a transmission medium rather than conventional telephony-centric network channels 456. Access to the telephony-centric network server 408 is obtained, however, in the very same manner that a caller obtains access to conventional long-distance carrier equipment: either via direct provisioning, or by entry of a PIC code, or by direct dialing of a corresponding access number, or as a result of a toll-free call being routed. Henceforth, the ensuing discussion assumes that access to the telephony-centric network server 408 has been obtained by one of the four aforementioned access methods.

When a caller originates a conventional long-distance call from an originating telephone 401 at POINT A, the local switch 454 routes the call to the telephony-centric network server 408. The telephony-centric network server 408, or local point of presence (POP) 408 converts electrical signals that are modulated for communication over the telephony-centric network into data packets for communication over the data-centric network 406. The data packets are then sent by the local POP 408 over the data-centric network 406 to the central call management server 402 in the Network Operations Center. The central call management server 402 receives the data packets transmitted over the data-centric network 406 and routes them to a destination local POP 408 at POINT B. Thus the central call management server 402 provides network packet transmission and routing for conventional toll calls over the data-centric network 406. Local POPs 408 at call destinations convert the data packets back into signals compatible with the telephony-centric network and provide these signals to corresponding local switches 454 for delivery of calls to recipients.

But recall that the placement of toll-free calls overrides any specification or provision of long-distance carrier made by a calling device 401. Thus, when a toll-free call is placed, the local switch 454 routes the toll-free call over a designated toll-free carrier channel 406, 456 to a toll-free subscriber. Hence, if the toll-free subscriber has obtained a first toll-free number

through a carrier associated with telephony-centric channel 0 456, the all calls to the first toll-free number will be routed by the local switch 454 through channel 0 456. If, on the other hand, a different subscriber 401 obtains a second toll-free number from a carrier that employs the present invention, then all calls to the second toll-free number will be routed by the local switch 454 to a corresponding local POP 408.

The local POPs 408 according to the present invention possess the capability to monitor signaling commands provided from an originating device 401 for the express purpose of intercepting and servicing toll-free calls to designated toll-free numbers. Rather than immediately routing a toll-free call over the data-centric network channel 406, logic within the local POP 408 services the call in accordance with a locally-stored service procedure. In one embodiment, the service procedure directs the local POP 408 to answer the call and prompt the caller to enter data to be subsequently transferred to a corresponding toll-free subscriber 401. In another embodiment, the service procedure directs the local POP 408 to answer the call and prompt the caller to select options from a sequence of voice menus. The selected options are then used to optimally route the call to various locations associated with the subscriber. Based upon the selections made by the caller, the ensuing toll-free call may even be routed to a telephone number different from the one entered to initiate the call. In an alternative embodiment, the service procedure directs the local POP 408 to answer the call and to provide automated response features to include voice-activated FAQ and automated facsimile response. Following intercept and service of a toll-free call by a local POP 408, if the caller has not yet terminated the call, then the call routed to the subscriber 401 over the data-centric network 406 like any other long-distance call.

In addition to routing packets for long-distance calls, the central call management server 402 maintains a master data base 404 of all service procedures. To update the local POPs 408, the central call management server 402 downloads selected service procedures over the data-centric network 406.

Now referring to FIGURE 5, a block diagram 500 is presented illustrating details of a local telephony-centric network server 520 according to the present invention. The block diagram 500 shows a local POP 520 at POINT A, an origination point for a toll-free call, connected to a data-centric network 530 according to the present invention. The local POP is also coupled to a local switch 510. The local switch 510 includes routing logic 512 that

provides toll-free call requests to the local POP 520 via bus 516. The local POP 520 includes local intercept logic 521, service procedure logic 522, and a call manager 525.

Operationally, intercept and service of a toll-free call can be obtained in two different ways: a first way of intercept and service occurs when a caller has already accessed the local POP 520—through either direct provisioning, PIC code entry, or by dialing a direct access number—and the caller subsequently dials a toll-free number that has not been provided by a carrier employing the present invention. In this case, the local intercept logic 521, upon receiving signaling commands from an originating telephone, will scan entries 523 in the service procedure logic 522 to determine if the call is to be intercepted and serviced. If so, then a service procedure stored in a selected entry 522 is transferred to the call manager 525. The call manager subsequently conducts an automated call session with the caller in accordance with the selected service procedure. If the call has not terminated following completion of the service procedure, because the toll-free number is not provided by a carrier employing the present invention, the call is routed back to the local switch 454 for completion via the designated carrier's channel 456.

A second manner of intercept is provided in the case that a toll-free carrier according to the present invention has provided a toll-free number to a subscriber. In this case, when any caller dials the toll-free number, routing logic 512 within the local switch 510 will transfer the call to the local POP 520 for completion. Because the local POP 520 belongs to the carrier providing the toll-free number, once the call manager 525 completes a corresponding service procedure, if a caller has not terminated the call, then the call is sent to the subscriber facility over the data-centric network 530 for completion.

Because toll-free calls are intercepted and serviced locally by a local POP 520 according to the present invention, a corresponding toll-free subscriber does not incur any toll carrier charges while the call is being serviced. Only when the call, if required, is subsequently completed do charges begin to accrue. In many instances, because of the effectiveness of automated FAQ procedures, a subscriber will not ever receive a call because callers choose to terminate prior to the call being completed. Two benefits arise from this. First, the subscriber does not incur hold-time charges. Second, because the call is serviced at a local level, incoming trunks at the subscriber's facility are not accessed, thereby allowing other calls to progress without undue traffic.

Now referring to FIGURE 6, a flow chart 600 is presented illustrating a method according to the present invention for locally intercepting and managing a toll-free call. The method depicts one embodiment representing the case where a toll-free number has been issued by a carrier utilizing a data-centric network carrier channel according to the present invention.

Flow begins at block 602, where a call is placed by a caller utilizing an originating device that is connected to a local telephone network exchange. Flow then proceeds to block 604.

At block 604, the call is routed by the local telephone network exchange to a local telephone network server according to the present invention. The call is routed to the local telephone network server because of 1) a carrier channel corresponding to the present invention has been prescribed either through direct provisioning, PIC code entry, or direct dial access to the local server; or 2) a toll-free number provided by a carrier according to the present invention has been entered by the caller. Local calls are executed exclusively by the local telephone network exchange and are thus never routed to the local telephone network server. Flow then proceeds to decision block 606.

At decision block 606, the telephone number entered by the caller is evaluated to determine if a toll-free call has been prescribed. If so, then flow proceeds to decision block 610. If not, then it is determined that the caller has simply prescribed a toll call and has specified that the toll call be routed over a data-centric network according to the present invention. Thus, flow proceeds to block 608.

At block 608, the toll call is converted into data packets and routed over the data network to a destination local telephone network server for completion. Flow then proceeds to block 620.

At decision block 610, because it has been determined that a toll-free call has been prescribed, a data base resident in the local telephone network server is scanned to determine if the toll-free call should be intercepted and serviced locally. If so, then flow proceeds to block 612. If not, then flow proceeds to block 618.

At block 618, since the toll-free call is not specified to be intercepted and serviced locally, the telephone network server routes the call to its destination. If the corresponding toll-free number has been provided by a carrier according to the current invention, then the toll-free call is routed to its destination via the data-centric network. If the toll-free number has been

provided by a different carrier, then the toll-free call is routed back to the local switch so that routing logic within the local switch can transfer the toll-free call to the different carrier's channel. Flow then proceeds to block 620.

At block 612, a service procedure corresponding to local service of the toll-free call is retrieved from logic within the local telephone network server. Flow then proceeds to block 614.

At block 614, the logic within the local telephone network server services the toll-free call in accordance with the retrieved service procedure. Flow then proceeds to decision block 616.

At decision block 616, following completion of the service procedure, the status of the toll-free call is evaluated to determine if the caller has terminated the call, or if the caller still desires to complete the call. If the call has been terminated, then flow proceeds to block 620. If completion of the call is required, then flow proceeds to block 618.

At block 620, the method completes.

Now referring to FIGURE 7, a flow chart 700 is presented illustrating a service procedure according to the present invention for allowing a caller to access answers to frequently asked questions.

Flow begins at block 702, where a toll-free call is intercepted for service by a local POP according to the present invention. Local intercept logic within the local POP extracts an FAQ service procedure from a local service procedure data base corresponding to the called toll-free number. The service procedure is passed to a call manager within the local POP. Flow then proceeds to block 704.

At block 704, the call manager plays a prerecorded audio message giving the caller the option to either listen to answers to frequently asked questions or to speak with a service representative. Flow then proceeds to decision block 706.

At decision block 706, signaling commands for the call are monitored to determine the caller's choice. If the caller chooses to listen to answers to frequently asked questions, then flow proceeds to block 710. If the caller chooses to speak with a service representative, then flow proceeds to block 722. If any other signaling command is provided, then flow proceeds to block 708.

At block 708, an audio message is played informing the caller that an invalid response has been entered. Flow then proceeds to block 704, where the original message is repeated.

At block 710, a FAQ menu audio message is played directing the caller to select between a FAQ addressing installation of product XYZ and a FAQ addressing operation of product XYZ. Flow then proceeds to decision block 714.

At decision block 714, signaling commands for the call are monitored to determine the caller's choice. If the caller chooses to listen to a FAQ addressing installation of product XYZ, then flow proceeds to block 716. If the caller If the caller chooses to listen to a FAQ addressing operation of product XYZ, then flow proceeds to block 718. If any other signaling command is provided, then flow proceeds to block 712.

At block 712, an audio message is played informing the caller that an invalid response has been entered. Flow then proceeds to block 710, where the FAQ menu is repeated.

At block 716, an audio message addressing installation of product XYZ is played for the caller. Flow then proceeds to decision block 720.

At block 718, an audio message addressing operation of product XYZ is played for the caller. Flow then proceeds to decision block 720.

At decision block 720, the call is evaluated to determine if the caller has terminated the call. If so, then flow proceeds to block 724. If not, then flow proceeds to block 722.

At block 722, either the caller has initially selected to speak with a service representative or the caller has subsequently selected to speak with a service representative by staying connected after listening to a FAQ selection. In either event, the call is routed to a toll-free subscriber facility via a corresponding toll-free carrier network. Flow then proceeds to block 724.

At block 724, the service procedure completes.

Now referring to FIGURE 8, a flow chart 800 is presented illustrating a service procedure according to the present invention for determining optimum call routing.

Flow begins at block 802, where a toll-free call is intercepted for service by a local POP according to the present invention. Local intercept logic within the local POP extracts an FAQ service procedure from a local service procedure data base corresponding to the called toll-free

number. The service procedure is passed to a call manager within the local POP. Flow then proceeds to block 804.

At block 804, the call manager plays a prerecorded audio message giving the caller the option to select whether the call concerns a hardware problem or a software problem. Flow then proceeds to decision block 808.

At decision block 808, signaling commands for the call are monitored to determine the caller's choice. If the caller indicates that a hardware problem exists, then flow proceeds to block 810. If the caller indicates that a software problem exists, then flow proceeds to block 812. If any other signaling command is provided, then flow proceeds to block 806.

At block 810, the call is routed over a corresponding toll-free carrier to a first toll-free number for addressing hardware problems. Flow then proceeds to block 814.

At block 812, the call is routed over a corresponding toll-free carrier to a second toll-free number for addressing software problems. Flow then proceeds to block 814.

At block 806, an audio message is played informing the caller that an invalid response has been entered. Flow then proceeds to block 804, where the original routing menu is repeated.

At block 814, the optimum call routing service procedure completes.

Although the present invention and its objects, features, and advantages have been described in detail, other embodiments are encompassed by the invention. For example, the present invention has been particularly characterized by completion of toll and toll-free calls over the Internet data-centric network. Although the Internet is widely used today for transmission of messages between communication devices, the present invention is not dependent upon such capability being provided. The data-centric network element according to the present invention can be embodied as a private network utilizing proprietary or leased communication channel assets.

In addition, the present invention has been specifically discussed with reference to interception and service of toll-free calls where the corresponding toll-free numbers are provided either via a carrier utilizing equipment according to the present invention or by a different carrier. It is appreciated that it is not common business practice today to intercept and service calls to numbers that are provided by another business entity. However, this model is

also applicable to situations in which a given toll-free number provider does not enjoy routing and carrier channel equipment at a particular local switch. In this case, the present invention can be employed as surrogate equipment for the given toll-free number provider.

Furthermore, the present invention has been characterized in terms the interception and service of calls to toll-free numbers that utilize real-time audio, i.e., voice, as a communication means. However, it is within the scope of the present invention to provide local intercept and service of other forms of communications such as facsimile or other electronic text forms. Utilizing the efficiency of a data-centric network for transfer of electronic information such as facsimile results is greater cost savings to a toll-free subscriber. In this case, a corresponding service procedure may merely conduct an interactive session with a caller to obtain certain data in electronic form. Following this, the caller terminates the call and the obtained data is transferred as a burst over the data-centric network. Rather than incur the cost of the interactive session, a corresponding toll-free subscriber simply incurs the cost of the burst transfer.

Those skilled in the art should appreciate that they can readily use the disclosed conception and specific embodiments as a basis for designing or modifying other structures for carrying out the same purposes of the present invention without departing from the spirit and scope of the invention as defined by the appended claims.

What is claimed is:

1. A method for intercepting and managing a toll-free call, comprising:

a) accessing a telephony-centric network server;

b) detecting initiation of the toll-free call;

c) prior to transferring the toll-free call to a corresponding toll-free carrier channel, servicing the toll-free call; and

d) if required, utilizing the corresponding toll-free carrier channel to complete the toll-free call.

2. The method as recited in claim 1, wherein said accessing comprises:

i) routing a connection from an originating device through its corresponding local telephone switch to the telephony-centric network server; and

ii) monitoring signaling commands provided by the originating device.

3. The method as recited in claim 2, wherein said routing is initiated automatically as a result of direct provisioning.

4. The method as recited in claim 2, wherein said routing is initiated as a result of a caller providing a PIC code to the corresponding local telephone switch.

5. The method as recited in claim 2, wherein said routing is initiated as a result of a caller dialing a telephone number.

6. The method as recited in claim 2, wherein the originating device is a telephone.

7. The method as recited in claim 2, wherein the originating device is a computer.

8. The method as recited in claim 2, wherein said detecting comprises evaluating the signaling commands to determine if the toll-free call is prescribed for intercept and service.

9. The method as recited in claim 8, wherein said servicing comprises interactively conducting a call session with a caller in accordance with service procedures for the toll-free call, the service procedures being maintained within the telephony-centric network server.

10. The method as recited in claim 9, wherein the service procedures comprise data entry procedures.

11. The method as recited in claim 10, wherein the data entry procedures prompt the caller from the originating device to enter information to be transmitted to a toll-free subscriber.

12. The method as recited in claim 9, wherein the service procedures comprise call routing procedures.

13. The method as recited in claim 12, wherein the call routing procedures prompt the caller from the originating device to select options from a menu that determine optimum routing for the toll-free call.

14. The method as recited in claim 13, wherein optimum routing for the toll-free call comprises routing the toll-free call to a telephone number that is different from the telephone number provided to initiate the toll-free call.

15. The method as recited in claim 9, wherein the service procedures comprise automated facsimile procedures.

16. The method as recited in claim 15, wherein the automated facsimile procedures prompt the caller from the originating device to select a topic from a menu, and wherein the local telephony-centric network server will subsequently initiate a call to deliver a fax to the caller addressing the selected topic.

17. The method as recited in claim 1, wherein said utilizing comprises:

i) determining that a caller has not terminated the toll-free call following said servicing; and

ii) completing the toll-free call via the corresponding toll-free carrier channel.

18. An apparatus for locally managing a toll-free call, the apparatus comprising:

a telephony-centric network server, configured to detect initiation of the toll-free call, to intercept the toll-free call, and to service the toll-free call prior to accessing a corresponding toll-free carrier channel, wherein the toll-free call is serviced according to a corresponding service procedure stored within said telephony-centric network server; and

a central call management server, coupled to said telephony-centric network server, configured to maintain service procedures, and configured to provide said corresponding service procedure to said telephony-centric network server.

19. The apparatus as recited in claim 18, wherein said telephony-centric network server is accessed from a local switch by direct provisioning of an originating line.

20. The apparatus as recited in claim 18, wherein said telephony-centric network server is accessed from a local switch as a result of a caller entering a PIC code via an originating line.

21. The apparatus as recited in claim 18, wherein said telephony-centric network server is accessed from a local switch as a result of a caller dialing a telephone number to access said telephony-centric network server from an originating line.

22. The apparatus as recited in claim 18, wherein the toll-free call is originated from a telephone.

23. The apparatus as recited in claim 18, wherein the toll-free call is originated from a computer.

24. The apparatus as recited in claim 18, wherein said telephony-centric network server evaluates signaling commands transmitted from an originating line to determine if the toll-free call is prescribed for intercept and service.

25. The apparatus as recited in claim 24, wherein said corresponding service procedure comprises a data entry procedure that prompts a caller to enter information to be transmitted to a toll-free subscriber.

26. The apparatus as recited in claim 24, wherein said corresponding service procedure comprises a call routing procedure that prompts a caller to select options from a menu that determine optimum routing for the toll-free call.

27. The apparatus as recited in claim 26, wherein the toll-free call is routed to a telephone number that is different from that provided by said caller to initiate the toll-free call.

28. The apparatus as recited in claim 24, wherein said corresponding service procedure comprises an automated facsimile procedure that prompts a caller to select a topic from a menu, and, in response, said telephony-centric network server initiates a call to deliver a fax to said caller addressing said topic.

29. The apparatus as recited in claim 24, wherein said corresponding service procedure directs said telephony-centric network server to complete the toll-free call via said corresponding toll-free carrier channel.

30. The apparatus as recited in claim 29, wherein said central call management server provides said corresponding service procedure to said telephony-centric network server over a data-centric network.

31. The apparatus as recited in claim 30, wherein said data-centric network is the internet.

32. A toll-free call management apparatus, comprising:

a telephony-centric network server, for intercepting and servicing a toll-free call prior to accessing a corresponding toll-free carrier channel, said telephony-centric network sever comprising:

intercept logic, for monitoring signaling commands provided from equipment that has accessed said telephony-centric network server, and for detecting if said signaling commands direct placement of said toll-free call; and

a call manager, coupled to said intercept logic, for servicing said toll-free call according to a corresponding service procedure; and

a central call management server, coupled to said telephony-centric network server, configured to provide said corresponding service procedure to said telephony-centric network server.

33. The toll-free call management apparatus as recited in claim 32, wherein said telephony-centric network server is accessed from a local switch by direct provisioning of said equipment.

34. The toll-free call management apparatus as recited in claim 32, wherein said telephony-centric network server is accessed from a local switch as a result of a caller entering a PIC code from said equipment.

35. The toll-free call management apparatus as recited in claim 32, wherein said telephony-centric network server is accessed from a local switch as a result of a caller dialing a telephone number to access said telephony-centric network server from said equipment.

36. The toll-free call management apparatus as recited in claim 32, wherein said equipment comprises a telephone.

37. The toll-free call management apparatus as recited in claim 32, wherein said equipment comprises a computer.

38. The toll-free call management apparatus as recited in claim 32, wherein said corresponding service procedure directs said call manager to prompt a caller to enter information to be transmitted to a toll-free subscriber.

39. The toll-free call management apparatus as recited in claim 32, wherein said corresponding service procedure directs said call manager to prompt a caller to select options from a menu that determine optimum routing for said toll-free call.

40. The toll-free call management apparatus as recited in claim 39, wherein said toll-free call is routed to a telephone number that is different from that provided by said caller to initiate said toll-free call.

41. The toll-free call management apparatus as recited in claim 32, wherein said corresponding service procedure directs said call manager to prompt a caller to select a topic from a menu, thereby prescribing a fax for delivery to said caller that addresses said topic.

42. The toll-free call management apparatus as recited in claim 32, wherein said corresponding service procedure directs said call manager to complete said toll-free call via said corresponding toll-free carrier channel.

43. The toll-free call management apparatus as recited in claim 42, wherein said central call management server provides said corresponding service procedure to said telephony-centric network server over a data-centric network.

44. The toll-free call management apparatus as recited in claim 43, wherein said data-centric network is the internet.

45. An apparatus for locally servicing a toll-free call, the toll-free call being initiated over an originating line that has accessed a telephony-centric network server, comprising:

service procedure logic, for prescribing a number identifying the toll-free call along with a corresponding service procedure;

intercept logic, coupled to said service procedure logic, for monitoring signaling commands provided from the originating line to determine if said number has been entered, and for accessing said service procedure logic to retrieve said corresponding service procedure;

a call manager, coupled to said intercept logic, for servicing the toll-free call according to said corresponding service procedure; and

a data-centric network, coupled to service procedure logic, for providing said corresponding service procedure to said service procedure logic from a network operations center.

46. The apparatus as recited in claim 45, wherein said signaling commands are provided by a telephone.

47. The apparatus as recited in claim 45, wherein said signaling commands are provided by a computer.

48. The apparatus as recited in claim 45, wherein said corresponding service procedure directs said call manager to prompt a caller to enter information to be transmitted to a toll-free subscriber.

49. The apparatus as recited in claim 45, wherein said corresponding service procedure directs said call manager to prompt a caller to select options from a menu that determine optimum routing for the toll-free call.

50. The apparatus as recited in claim 45, wherein the toll-free call is routed to a telephone number that is different from that entered from the originating line to initiate the toll-free call.

51. The apparatus as recited in claim 45, wherein said corresponding service procedure directs said call manager to prompt a caller to select a topic from a menu, thereby prescribing a fax for delivery to said caller that addresses said topic.

52. The apparatus as recited in claim 45, wherein said corresponding service procedure directs said call manager to complete the toll-free call via a corresponding toll-free carrier.

53. The apparatus as recited in claim 45, wherein said data-centric network is the internet.

54. The apparatus as recited in claim 45. wherein said service procedure logic comprises memory within a computer.

55. The apparatus as recited in claim 54, wherein said call manager comprises a software application program in a computer.

56. The apparatus as recited in claim 55, wherein said intercept logic comprises a software application program in a computer.

FIG. 1 (Related Art)

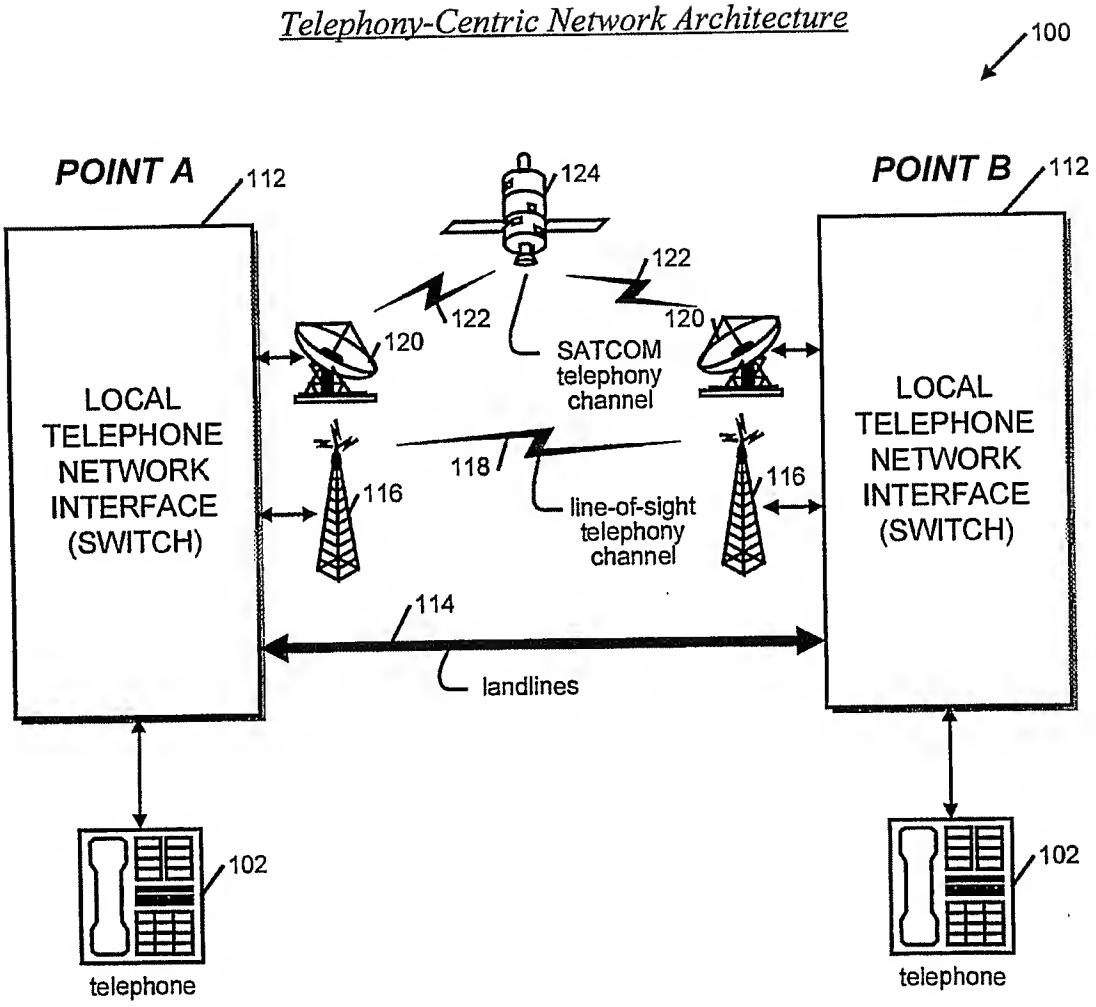


FIG. 2 (Related Art)

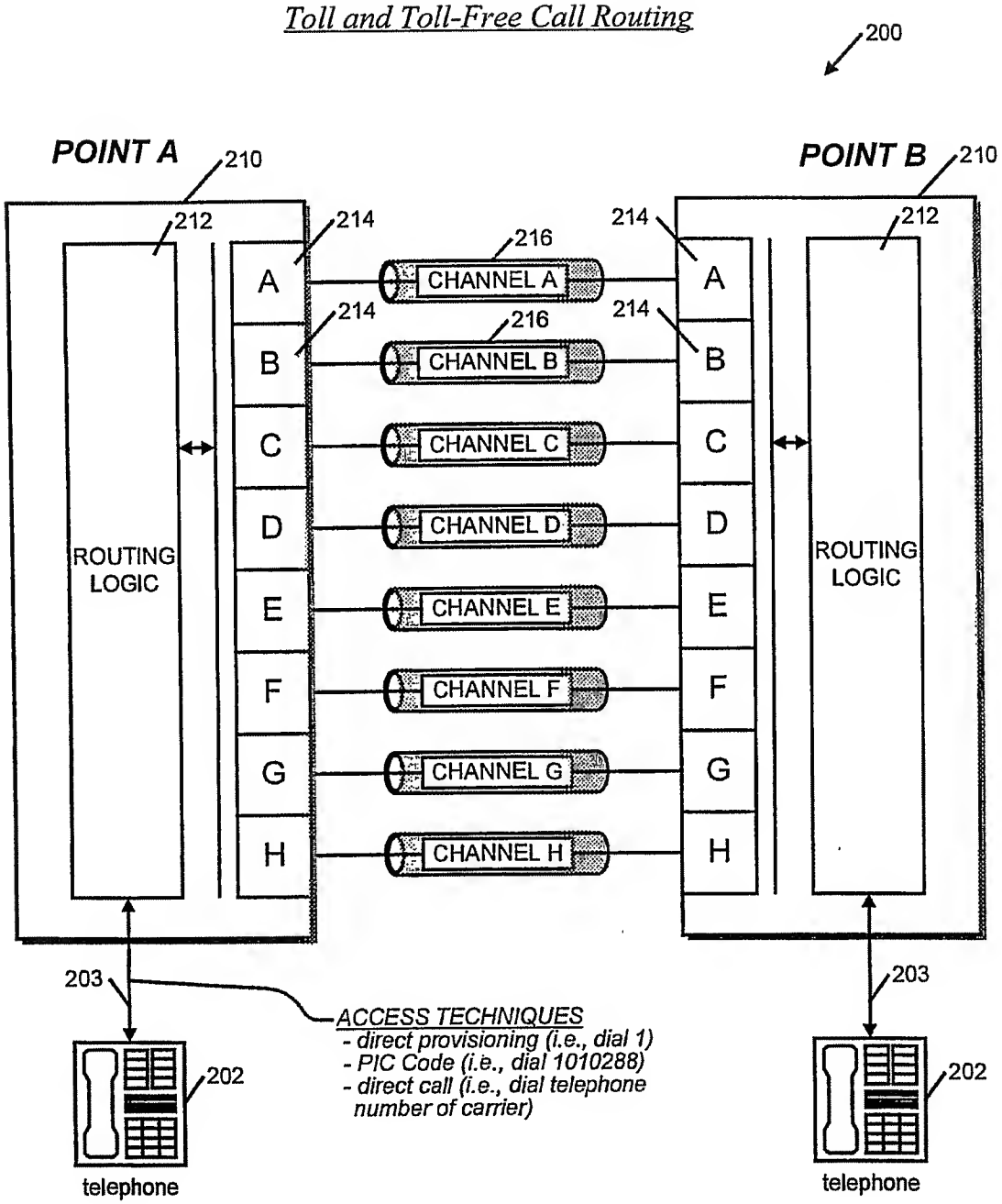


FIG. 3 (Related Art)

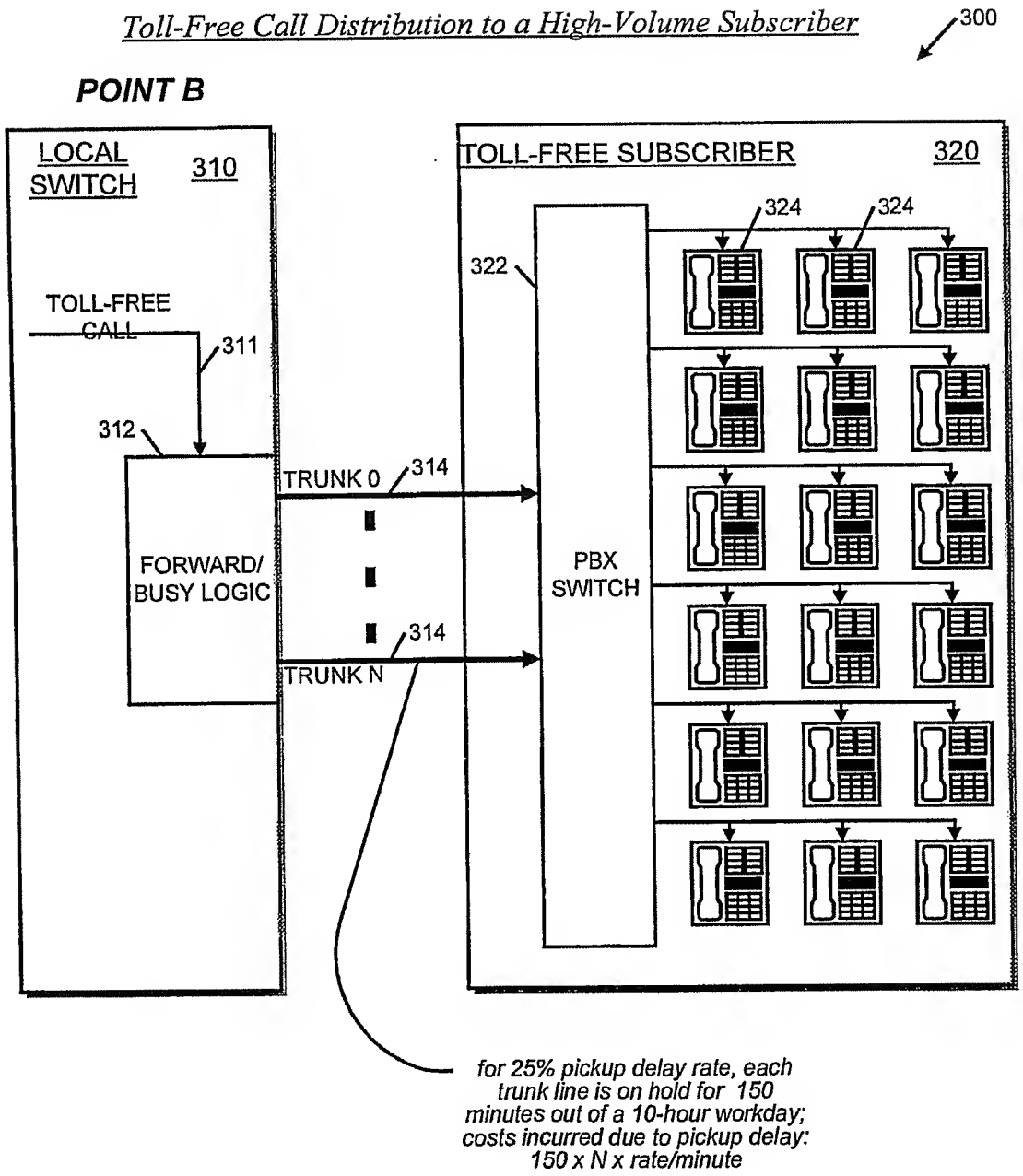


FIG. 4

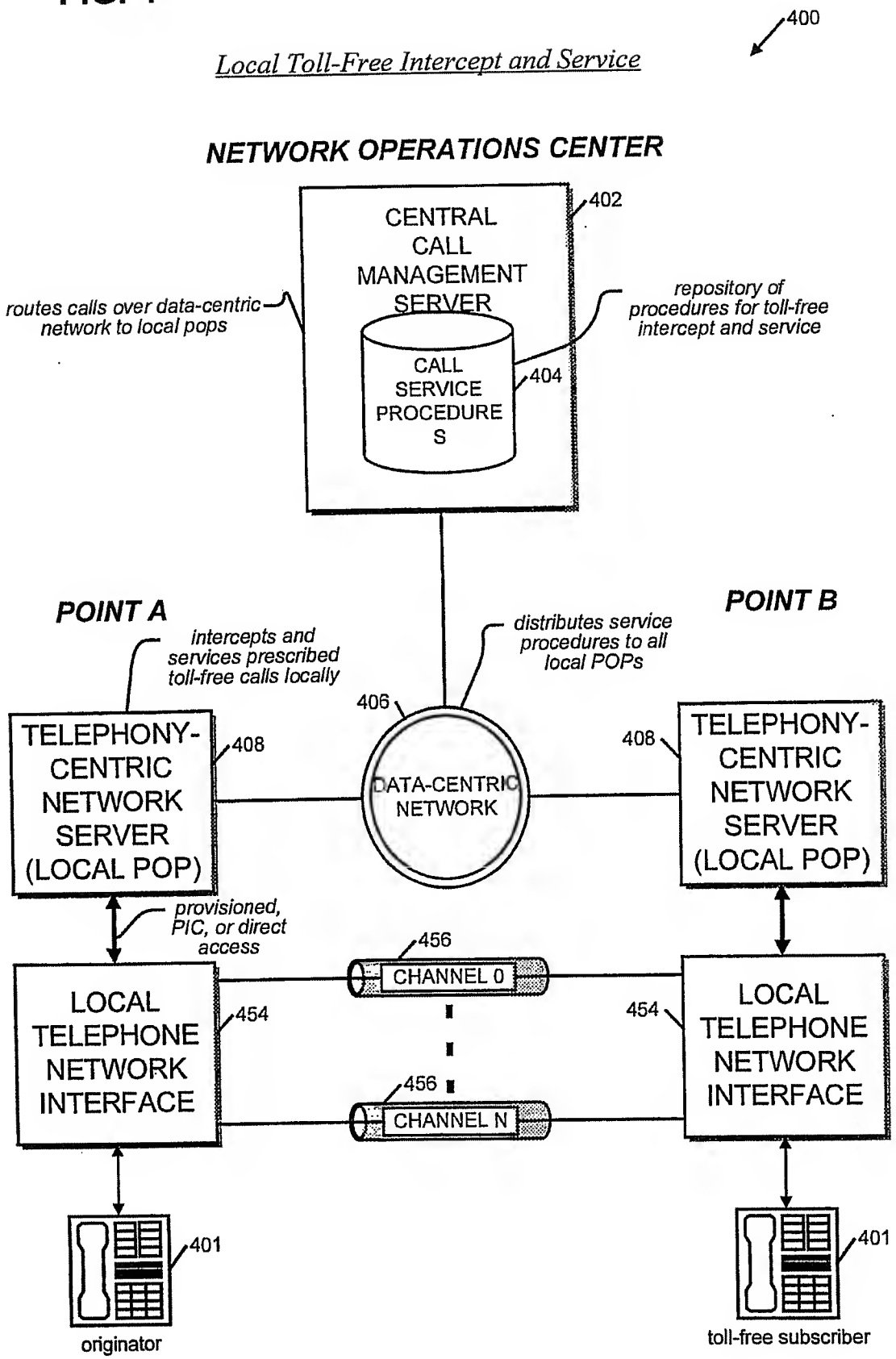

400
Local Toll-Free Intercept and Service
NETWORK OPERATIONS CENTER
CENTRAL CALL MANAGEMENT SERVER
402
routes calls over data-centric network to local pops
repository of procedures for toll-free intercept and service
CALL SERVICE PROCEDURE S
404
POINT A
POINT B
intercepts and services prescribed toll-free calls locally
distributes service procedures to all local POPs
406
TELEPHONY-CENTRIC NETWORK SERVER (LOCAL POP)
408
DATA-CENTRIC NETWORK
TELEPHONY-CENTRIC NETWORK SERVER (LOCAL POP)
provisioned, PIC, or direct access
456
CHANNEL 0
LOCAL TELEPHONE NETWORK INTERFACE
454
CHANNEL N
401
originator
toll-free subscriber

FIG. 5

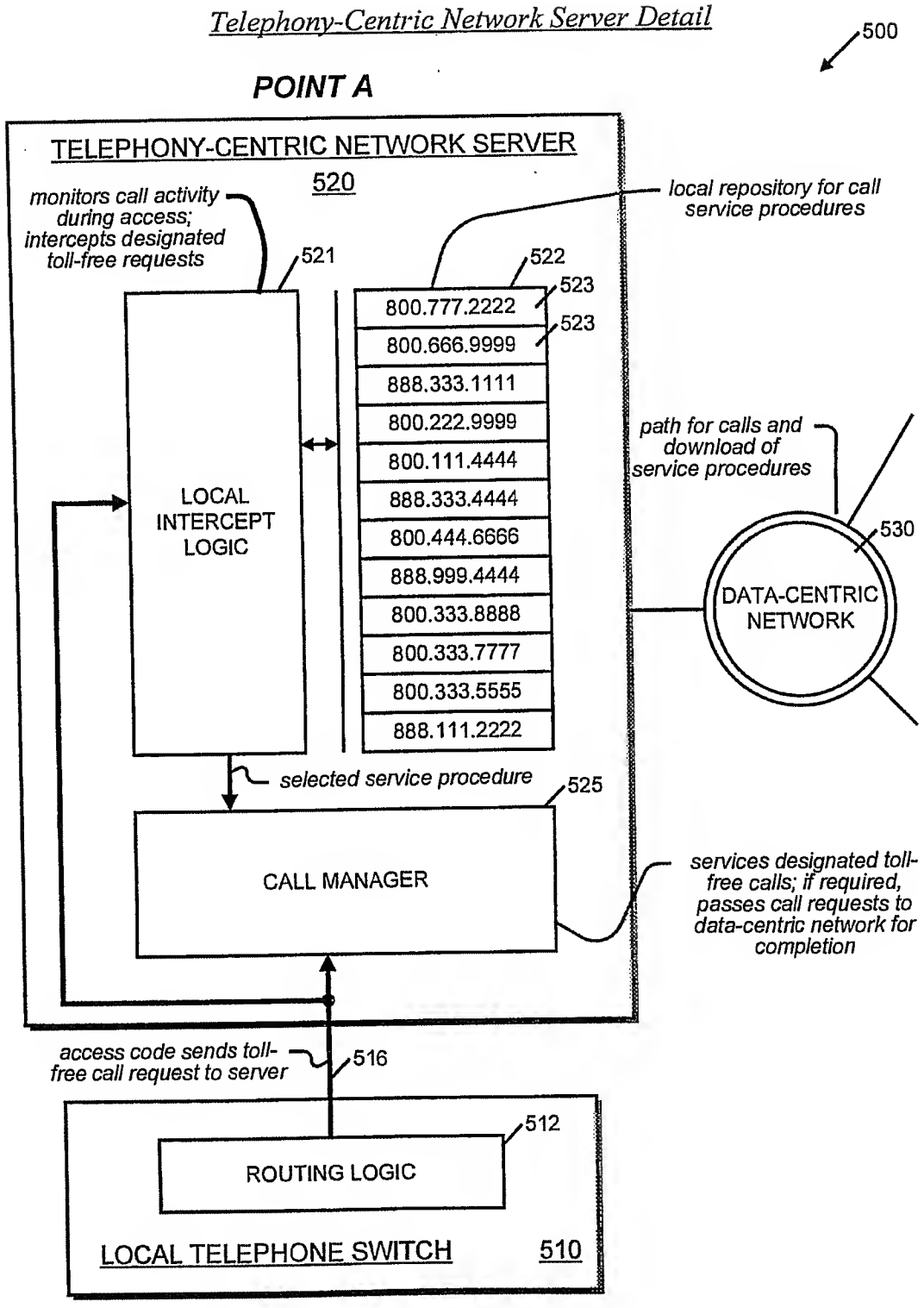

Telephony-Centric Network Server Detail
500
POINT A
TELEPHONY-CENTRIC NETWORK SERVER
520
monitors call activity during access; intercepts designated toll-free requests
521
local repository for call service procedures
522
523
800.777.2222
523
800.666.9999
888.333.1111
800.222.9999
800.111.4444
888.333.4444
800.444.6666
888.999.4444
800.333.8888
800.333.7777
800.333.5555
888.111.2222
LOCAL INTERCEPT LOGIC
path for calls and download of service procedures
530
DATA-CENTRIC NETWORK
selected service procedure
525
CALL MANAGER
services designated toll-free calls; if required, passes call requests to data-centric network for completion
access code sends toll-free call request to server
516
512
ROUTING LOGIC
LOCAL TELEPHONE SWITCH
510

FIG. 6

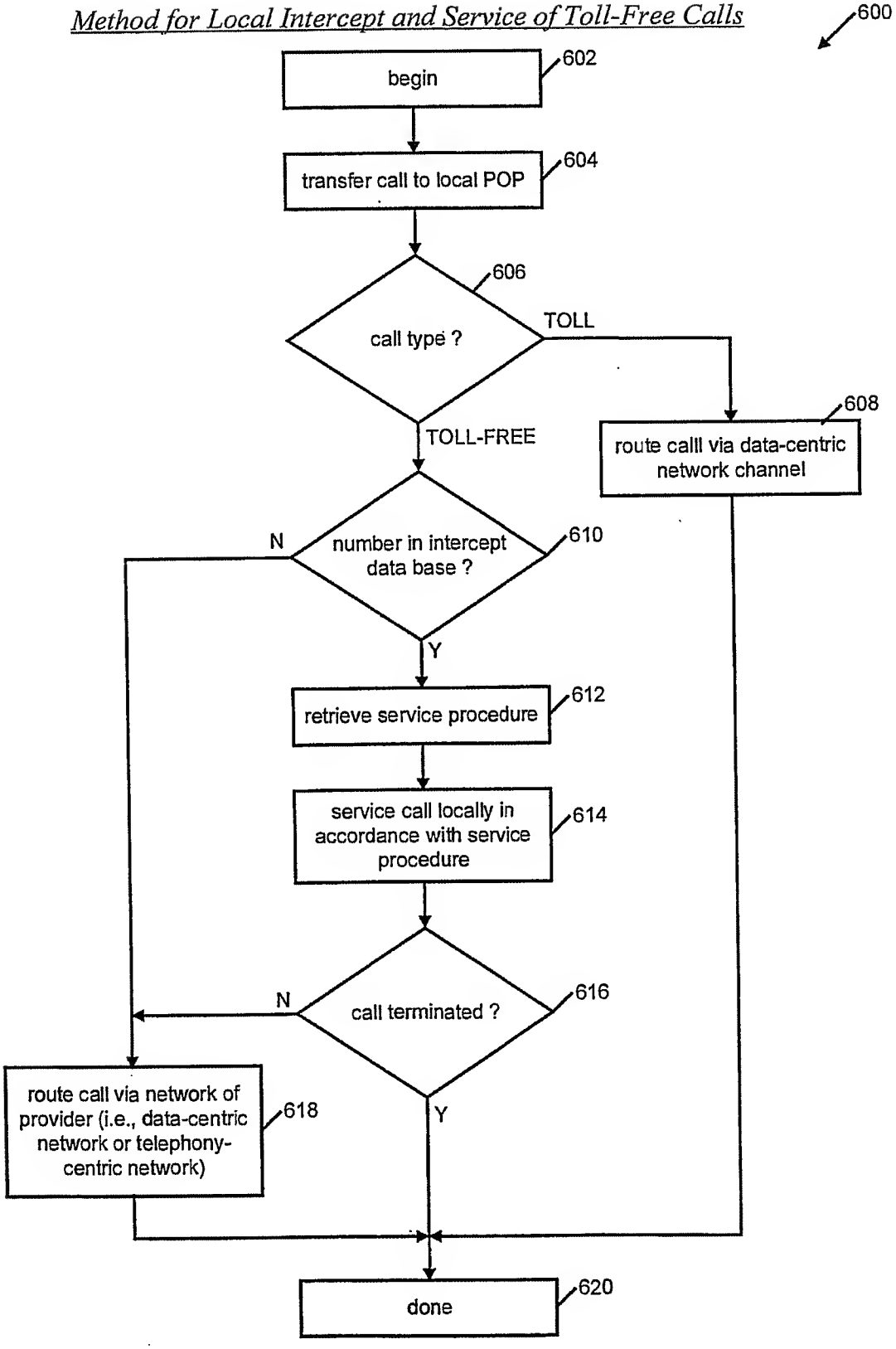

Method for Local Intercept and Service of Toll-Free Calls
600
begin
602
transfer call to local POP
604
606
call type ?
TOLL
TOLL-FREE
608
route calll via data-centric network channel
N
number in intercept data base ?
610
Y
retrieve service procedure
612
service call locally in accordance with service procedure
614
N
call terminated ?
616
route call via network of provider (i.e., data-centric network or telephony-centric network)
618
Y
done
620

FIG. 7

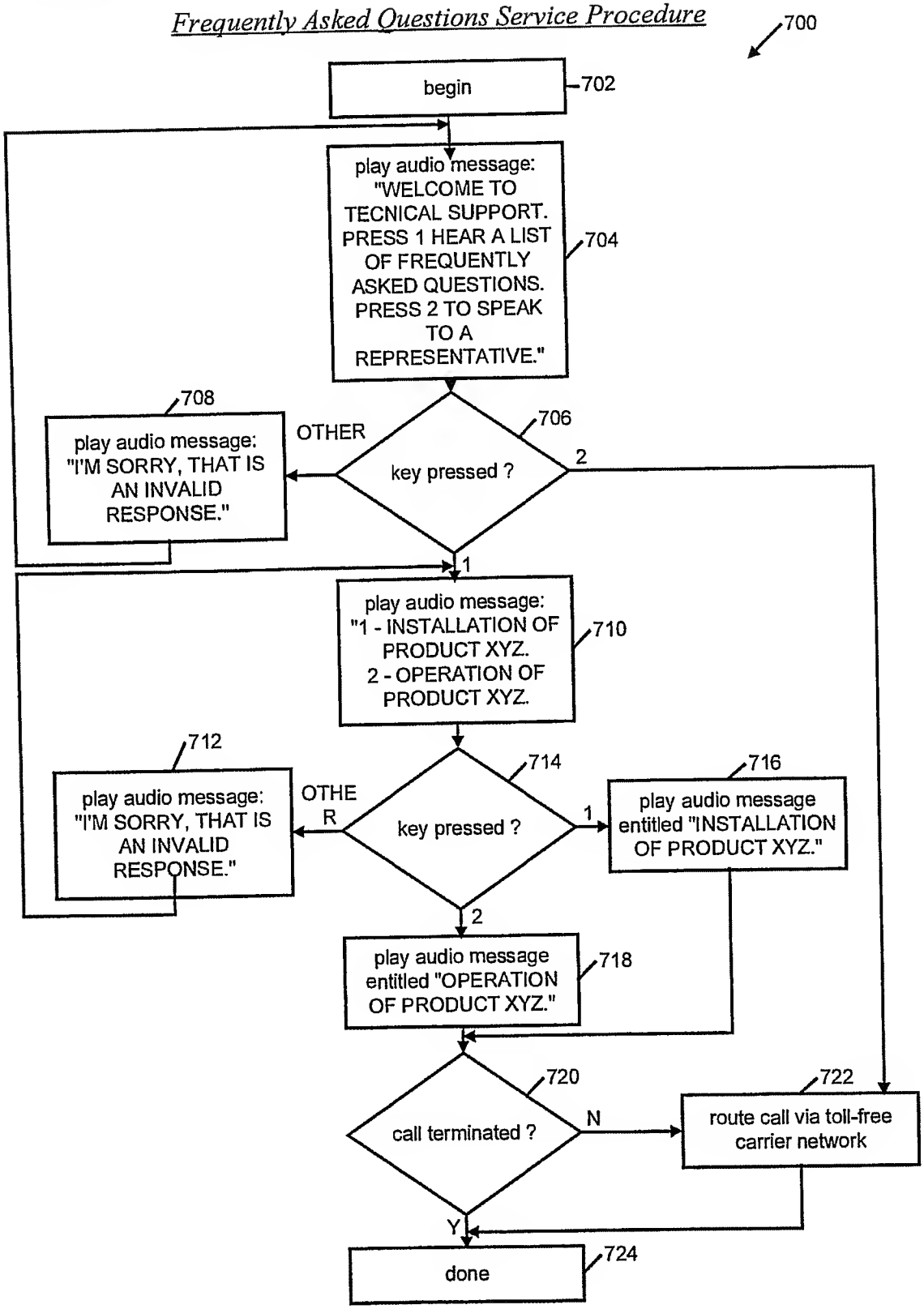
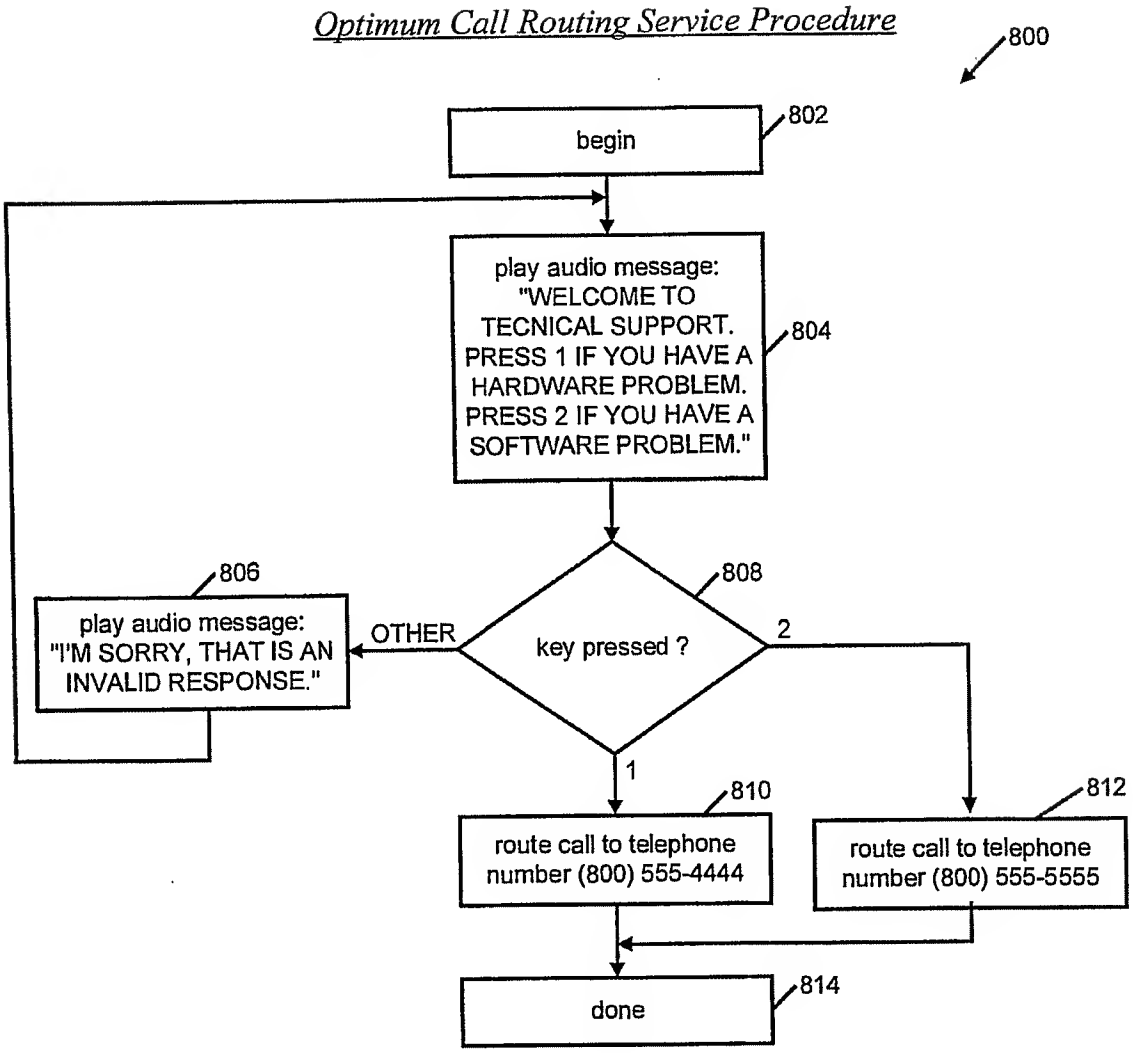

Frequently Asked Questions Service Procedure
700
begin
702
play audio message: "WELCOME TO TECNICAL SUPPORT. PRESS 1 HEAR A LIST OF FREQUENTLY ASKED QUESTIONS. PRESS 2 TO SPEAK TO A REPRESENTATIVE."
704
key pressed ?
706
OTHER
play audio message: "I'M SORRY, THAT IS AN INVALID RESPONSE."
708
2
1
play audio message: "1 - INSTALLATION OF PRODUCT XYZ. 2 - OPERATION OF PRODUCT XYZ.
710
key pressed ?
714
OTHER
play audio message: "I'M SORRY, THAT IS AN INVALID RESPONSE."
712
1
play audio message entitled "INSTALLATION OF PRODUCT XYZ."
716
2
play audio message entitled "OPERATION OF PRODUCT XYZ."
718
call terminated ?
720
N
route call via toll-free carrier network
722
Y
done
724

FIG. 8


Optimum Call Routing Service Procedure
800
begin
802
play audio message: "WELCOME TO TECNICAL SUPPORT. PRESS 1 IF YOU HAVE A HARDWARE PROBLEM. PRESS 2 IF YOU HAVE A SOFTWARE PROBLEM."
804
key pressed ?
808
OTHER
play audio message: "I'M SORRY, THAT IS AN INVALID RESPONSE."
806
1
2
route call to telephone number (800) 555-4444
810
route call to telephone number (800) 555-5555
812
done
814

INTERNATIONAL SEARCH REPORT

Int ional application No.
PCT/US00/08193

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :H04M 7/00
US CL :379/222

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 379/222, 219, 220, 221, 229, 230, 242

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WEST

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,867,562 A (SCHERER) 02 February, 1999, see entire patent.	1-56

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 01 JUNE 2000	Date of mailing of the international search report 05 JUL 2000
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer KRISTA ZELE Telephone No. (703) 305-4701

Form PCT/ISA/210 (second sheet) (July 1998) ★